Remarks

At the time of the Office Action dated January 12, 2007, claims 1-43 were pending in the application and claims 1-43 were rejected. By this paper, Applicants amend claims 1, 7, 9, 12, 14, 18, 20, 21, 22, 28, 30-32 and 34 and cancels claims 6, 8, 17, 27, 29, 33 and 35-43. These amendments are not the result of any cited art. No new matter has been introduced by virtue of the present amendments. Applicants respectfully request reconsideration of the above application in view of the present amendments and following remarks.

Claims 1-3, 12-14, 22, 23, 26, 33, 35, 42 and 43 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Publication No. 2002/0108308 A1 (*Grieve*). Claims 33 and 35-43 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Publication No. 2003/0060364 A1 (*Anzai et al.*). Claims 4-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Grieve* in view of *Anzai et al.* Claims 10 and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Grieve* in view of U.S. Patent N. 6,670,070 (*Kearl*). Claims 15-20 stand rejected under U.S.C. § 103(a) as being unpatenable over *Grieve* in view of *Anzai et al.* Claim 21 stands rejected under 35 U.S.C. § 103(a) as being unpatenable over *Grieve* in view of *Anzai et al.* as applied to claim 20 above and further in view of *Kearl*. Claims 31 and 32 stand rejected under 35 U.S.C. § 103(a) as being unpatantable over *Grieve* in view of *Kearl*. Claim 34 stands rejected under 35 U.S.C. § 102 as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over *Anzai et al.*

Applicants respectfully traverse the Examiner's rejections. However, in order to facilitate allowance of the present application, Applicants hereby amend the claims to put them in a form to advance the prosecution of this case.

Independent claim 1 has been amended to recite a method including the steps of "heating [a] first mixture to a sufficient temperature of less than about 650°C to form a

second mixture and contacting the anode of a solid oxide fuel cell with the second gaseous mixture." The first mixture includes molecular oxygen and CH_3-O-R. Independent claim 14 has been amended to recite a method of "heating [a first]...mixture to a sufficient temperature of less than about 650°C to form a second mixture and contacting the anode of a solid oxide fuel cell with the second gaseous mixture." Independent claim 22 has been amended to recite a fuel cell system including a heat source that "heats [a]...first mixture to a sufficient temperature of less than about 650°C to form a second mixture" and "a conduit for contacting the anode of the solid oxide fuel cell with a second gaseous mixture."

The references cited by the Examiner in support of the rejections, i.e., *Grieve, Anzari et al.* and *Kearl*, taken individually or in combination, do not teach or suggest the claimed invention. The claimed invention, as amended, recites contacting the anode of <u>a solid oxide fuel cell</u> (SOFC) with a second gaseous mixture that is formed by heating a first mixture having the formula CH_3-O-R to <u>a sufficient temperature of less than about 650°C</u>. At best, *Grieve* teaches high temperature operation of reformers in combination with the use of solid oxide fuel cells to increase reformer efficiency and reformer life. "These reformers operate at high temperatures (e.g., about 800°C or greater). At lower temperatures, e.g., during start-up, deposition of carbon (or soot) upon the catalyst can adversely affect the reformer efficiency and reduce reformer life. Major requirements for the reformers are rapid start, dynamic response time, fuel conversion efficiency, size, and weight." ¶ [0009]. "Decomposition of the fuel to primarily hydrogen and carbon monoxide occurs through thermal reactions at high temperatures of about 700°C to about 1,000°C." ¶ [0020].

The claimed invention is directed at thermally decomposing the CH_3-O-R and molecular oxygen mixture. The claimed method and system operates at relatively low temperatures of less than about 650°C. Contrarily, the *Grieve* system operates at relatively high temperatures of about 700°C to 1,000°C. Further, the *Anzai et al.* reference does not teach or suggest the application of hydrocarbon fuels to solid oxide fuel cells, and the Examiner does not argue otherwise. Moreover, *Kearl* does not teach or suggest the operation of a SOFC with a CH_3-O-R and molecular oxygen first mixture, which is heated to less than

about 650° and contacted with an anode of an SOFC. In light of the foregoing, the cited references, taken individually or in combination, do not teach or suggest the claimed invention. Therefore, Applicants respectfully the Examiner to withdraw the grounds of rejection.

Furthermore, there is no reason to combine the references of *Grieve* and *Anzai et al.* to render the claimed invention obvious. *Grieve* provides the use of hydrocarbon feed stocks in SOFCs wherein the feed stock is decomposed at a relatively high temperature. ¶¶ [0009] and [0020]. *Anzai et al.* does not disclose or suggest the use of hydrocarbon feed stocks in SOFCs. Moreover, *Grieve* teaches away from low reaction temperature ranges suggested by *Anzai et al.* in ¶ [0049]. For at least this reason, the claimed invention is patentable in light of the proposed combination of *Grieve* and *Anzai et al.*

Further, Applicants have amended claim 12 to recite the unexpected results achieved by Applicant's invention. Claim 12 now recites that the first mixture is formed by combining air and dimethyl ether, the first mixture includes 33% by volume of dimethyl ether and the first mixture is heated to a temperature of about 550°C. According to the examples disclosed in Applicants specification, an enhancement in voltage production can be achieved through operation of the claimed method:

> The results of experiments utilizing the apparatus of Figure 1 are provided in Figures 2-4. With reference to Figure 2, plots of voltage vs. current density for a SOFC fueled with a 100% DME gas composition and with a gaseous mixture of 33% DME in air are provided. Figure 2 shows higher voltages produced for current densities at higher temperatures. With reference to Figure 3, plots of power density vs. current density for pure DME and for a gaseous mixture of 33% DME in air are provided at 550°C, 600°C, and 650°C. At the highest temperatures the power density plots for the two gas compositions are nearly identical. <u>However, an enhancement for the air containing compositions is observed at 550°C and 600°C. This enhancement is completely unexpected.</u> With reference to Figure 4, plots of power density vs. current density for pure DME, for a gaseous mixture of 33% DME in air, and for a gaseous mixture of 33% DME in nitrogen are provided at

550°C. Figure 4 shows that the power enhancement is due to the presence of oxygen and not nitrogen.

This unexpected result shows that claim 12, as well as other claims of the Applicants invention, are not obvious in light of the proposed *Grieve* and *Anzai et al.* combination, as well as any other combinations of the cited references.

CONCLUSION

For the foregoing reasons, Applicant believes that the Office Action of January 12, 2007 has been fully responded to. Consequently, in view of the above amendments and remarks, Applicant respectfully submits that the application is in condition for allowance, which allowance is respectfully requested.

The Commissioner is hereby authorized to charge any fee deficiency associated with the filing of this Paper to the Deposit Account of Applicants' assignee, Ford Global Technologies LLC, Deposit Account No. 06-1510.

Respectfully submitted,

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